

Claims

885 What is claimed is:

1. An integrated human and computer interactive data mining method comprises the steps of:

- a) Input a database;
- 890 b) Perform knowledge creation selected from the group consisting of learning, modeling, and analysis using the database to create an initial knowledge model;
- c) Perform at least one query of the initial knowledge model;
- d) Perform visualization processing of the initial knowledge model to create a
895 knowledge presentation output.

2. The integrated human and computer interactive data mining method of claim 1 wherein the initial knowledge model is a regulation tree.

900 3. The integrated human and computer interactive data mining method of claim 1 wherein the knowledge presentation output further comprises rule ranking by information integration.

4. The integrated human and computer interactive data mining method of claim 1
905 wherein the knowledge presentation output includes feature distribution profiles.

5. The integrated human and computer interactive data mining method of claim 1 further comprises a feedback and update request step that updates the initial knowledge model.

910 6. The integrated human and computer interactive data mining method of claim 1 wherein the knowledge creation step further comprises the steps of:

- a) Perform data organization using the database to create formatted data;

- b) Perform data modeling using the formatted data to create the initial knowledge model.

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7. An integrated human and computer interactive data mining method comprises the steps of:

- a) Input a database;
- b) Perform knowledge creation selected from the group consisting of learning, modeling, and analysis using the database to create an initial knowledge model;
- c) Perform dynamic learning and knowledge representation using the initial knowledge model and the database to create or update a presentable knowledge model;

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8. The integrated human and computer interactive data mining method of claim 7 further comprises an interactive data mining step between the human and the presentable knowledge model.

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9. The integrated human and computer interactive data mining method of claim 7 wherein the dynamic learning and knowledge representation step further comprises an update learning step.

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10. The integrated human and computer interactive data mining method of claim 7 wherein the knowledge creation step further comprises the steps of:

- a) Perform data organization using the database to create formatted data;
- b) Perform data modeling using the formatted data to create the initial knowledge model.

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11. The integrated human and computer interactive data mining method of claim 8 wherein the interactive data mining step further comprises a visualization step.

12. The integrated human and computer interactive data mining method of claim 8 wherein the interactive data mining step further comprises a query step.

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13. The integrated human and computer interactive data mining method of claim 8 wherein the interactive data mining step further comprises a feedback and update request step.

950 14. A multiple level integrated human and computer interactive data mining method comprises the steps of:

- a) Input a database;
- b) Perform knowledge creation selected from the group consisting of learning, modeling, and analysis using the database to create an initial knowledge
955 model;
- c) Perform overview interactive data mining and dynamic learning and knowledge representation using the initial knowledge model and the database to create or update a presentable knowledge model.

960 15. The multiple level integrated human and computer interactive data mining method of claim 14 further performs zoom and filter interactive data mining and dynamic learning and knowledge representation using the presentable knowledge model and the database to create or update the presentable knowledge model.

965 16. The multiple level integrated human and computer interactive data mining method of claim 14 further performs details-on-demand interactive data mining and dynamic learning and knowledge representation using the presentable knowledge model and the database to create or update the presentable knowledge model.

970 17. The multiple level integrated human and computer interactive data mining method of claim 14 wherein the knowledge creation step further comprises the steps of:

- a) Perform data organization using the database to create formatted data;

- b) Perform data modeling using the formatted data to create the initial knowledge model.

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18. A presentable knowledge model generation method comprises the steps of:

- a) Input formatted data and a decision tree;
- b) Perform rule ranking using the formatted data and the decision tree to create ranked output;
- c) Perform feature profile generation using the formatted data and the decision tree to create feature profiles.
- d) Group the ranks and feature profiles to create a presentable knowledge model output.

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985 19. The presentable knowledge model generation method of claim 18 further comprising perform contrast example selection using the formatted data and the decision tree to create contrast examples and group the contrast examples, ranks, and feature profiles to create a presentable knowledge model output.

990 20. The presentable knowledge model generation method of claim 18 wherein rule ranking uses global characteristics and population characteristics selected from the set consisting of:

- a) Local counts;
- b) Local population statistics;
- c) Global counts;
- d) Global population statistics.

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1000 21. The presentable knowledge model generation method of claim 19 wherein the contrast examples are the high rank samples from both the correct label and the wrong label population.

22. The presentable knowledge model generation method of claim 18 wherein the feature profile generation method normalizes the automatically generated features.

1005 23. A tree update learning method comprises the steps of:

- a) Input formatted data and a decision tree;
- b) Remove a sample by:
 - i. Subtracting the data from the sample associated terminal node;
 - ii. Updating the statistics of each of the associated non-terminal nodes.

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24. The tree update learning method of claim 23 further comprises a step to remove a rule.

25. The tree update learning method of claim 23 further comprises a step to add a sample
1015 by:

- i. Adding the data to the sample associated terminal node;
- ii. Updating the statistics of each of the associated non-terminal nodes.

26. The tree update learning method of claim 23 further comprises a step to add a rule.

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27. An interactive data mining method comprises the steps of:

- a) Input a presentable knowledge model;
- b) Perform rule viewing of a terminal node in the presentable knowledge model
1025 by a parallel coordinate visualization technique that maps a multiple
dimensional space onto two display dimensions and at least one data item is
presented as a polygonal line.

28. The interactive data mining method of claim 27 further comprises a feature viewing
method that shows the histograms of the features as encoded bars.

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29. The interactive data mining method of claim 27 further comprises a contrast
presentation method that highlights representative samples from the correct label and
wrong label.

1035 30. The interactive data mining method of claim 27 performs data mining using multi-level abstraction.